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H. C. TAYLOR, Chief

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PRELIMINARY MANUFACTURING TESTS OF THE OFFICIAL COTTON STANDARDS OF THE UNITED STATES FOR COLOR FOR UPLAND TINGED AND STAINED COTTON.

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GRADES OF COTTON TESTED.

The spinning tests[1] herein described were conducted to determine the relative values of the following grades of cotton:

Low Middling	L.M.
Good Middling Yellow Tinged	G.M.Y.T.
Middling Yellow Tinged	M.Y.T.
Low Middling Yellow Tinged	L.M.Y.T.
Good Middling Yellow Stained	G.M.Y.S.
Middling Yellow Stained	M.Y.S.
Good Middling Blue Stained	G.M.B.S.
Middling Blue Stained	M.B.S.

ORIGIN OF COTTON USED.

The cotton for these tests was purchased by expert cotton classers of the Bureau of Markets for use in the preparation of the Official Cotton Standards of the United States for color for Upland tinged and stained cotton.

[1] This cotton was classed by members of the committee authorized to hear disputes under the provisions of the United States cotton futures act. The spinning tests were conducted in the textile department of the North Carolina State College of Agriculture and Engineering, under the general direction of W. R. Meadows, cotton technologist, and were made by W. G. Blair, specialist in cotton testing, assisted by C. E. Folk, E. S. Cummings, and H. B. Richardson, assistants in cotton testing, and E. F. Upton, formerly assistant in cotton testing.

Upon receipt of this cotton in Washington it was again classed and stapled and only typical bales of each grade were included in the final selection. By using this selection, the bulk of the off-colored cottons from the various districts of the cotton belt were included.

Table 1 shows the grade, weight, number of bales, length, and character of staple, point of origin, and the year in which the cotton was grown.

TABLE 1.—*Stock selected for spinning test on colored cotton.*

Grade.	Weight.	Staple length.	Character of staple.	Origin.	Crop.	Remarks.
	Pounds.	*Inch.*			*Year.*	
L.M	126	15/16	Medium	Little Rock, Ark	1919–20	Full on grade.
	100	15/16	Medium	Bay City, Tex	1919–20	Shy because of pin leaf.
	115	15/16	Medium	New York, N. Y	1917–18	
	140	15/16	Medium	Atlanta, Ga	1919–20	
	481					
G.M.Y.T	60	15/16	Medium	Atlanta, Ga	1917–18	
	60	15/16	Medium	Atlanta, Ga	1917–18	
	60	15/16	Medium	Atlanta, Ga	1917–18	
	60	15/16	Medium	Atlanta, Ga	1917–18	
	60	15/16	Medium	Little Rock	1917–18	
	300					
M.Y.T	40	7/8	Medium	Unknown	1917–18	
	60	15/16	Medium	Augusta, Ga	1917–18	
	60	15/16	Medium	Atlanta, Ga	1917–18	
	60	15/16	Medium	Savannah, Ga	1917–18	
	60	15/16	Medium	Memphis, Tenn	1917–18	
	280					
L.M.Y.T	87	15/16	Medium	Memphis, Tenn	1918–19	Full 15/16 inch.
	105	15/16	Medium	Chattanooga, Tenn	1916–17	
	80	15/16	Medium	Oklahoma City	1918–19	
	40	15/16	Medium	Savannah, Ga	1918–19	
	312					
G.M.Y.S	100	1	Medium	Memphis, Tenn	1918–19	
	106	1	Medium	Atlanta, Ga	1918–19	15/16 to 1 inch full.
	60	15/16	Medium	Memphis, Tenn	1917–18	
	266					
M.Y.S	133	15/16	Medium	Memphis, Tenn	1918–19	
	84	1	Medium	Memphis, Tenn	1918–19	Full inch.
	30	15/16	Medium	Atlanta, Ga	1918–19	Somewhat gin-cut.
	247					
G.M.B.S	110	15/16	Medium	Macon, Ga	1918–19	
	95	15/16	Medium	Greensboro, N. C	1918–19	
	52	7/8	Medium	Augusta, Ga	1918–19	
	257					
M.B.S	105	15/16	Medium	Greensboro, N. C	1918–19	
	100	7/8	Medium	Augusta, Ga	1917–18	
	107	1	Medium to hard.	Memphis, Tenn	1915–16	
	312					

MECHANICAL CONDITIONS.

The different bales of each grade of cotton were arranged around the hopper bale breaker in a semicircle. A layer from each bale was taken in rotation and placed in the hopper.

Each grade was opened during the afternoon, the opened cotton being placed in a bin and allowed to age overnight. It was not considered necessary to allow the cotton to age for a longer period because all the ties except two had been removed upon receipt of the cotton two months previously.

Preliminary tests were made on the cleaning machines, Low Middling cotton being used until the visible waste was approximately equal to that removed during the previous tests.[2] This was done in order that the merits of the several grades of white and colored cottons might be put as nearly as possible on a comparative basis.

The same mechanical conditions were maintained for all grades throughout the test.

The relative humidity in the carding and spinning rooms was maintained as nearly as possible between 60 and 65 per cent during the entire test.

PERCENTAGES OF WASTE.

Accurate records were kept of the net amount of cotton fed to each cleaning machine, the amount of each kind of waste discarded, and the weight of the finished product.

The waste percentages calculated from the above items are shown in Table 2.

TABLE 2.—*Percentages of waste from the different grades of cotton tested.*

Character of waste.	White.	Yellow Tinged.			Yellow Stained.		Blue Stained.	
	L.M.	G.M.Y.T.	M.Y.T.	L.M.Y.T.	G.M.Y.S.	M.Y.S.	G.M.B.S.	M.B.S.
PICKER WASTE.[a]	*Per ct.*	*Per cent.*	*Per ct.*	*Per cent.*	*Per cent.*	*Per ct.*	*Per cent.*	*Per ct.*
Opener-breaker motes and fly	1.63	1.00	1.20	1.87	0.81	0.86	1.36	2.08
Finisher motes and fly	.83	.50	.64	1.17	.50	.97	.68	1.30
Total visible	2.46	1.50	1.84	3.04	1.31	1.83	2.04	3.38
Invisible	2.93	.99	1.17	1.12	.25	1.50	.25	1.70
Total visible and invisible	5.39	2.49	3.01	4.16	1.56	3.33	2.29	5.08
CARD WASTE.[b]								
Flat strippings	2.57	2.88	3.32	3.53	2.64	3.93	2.57	2.98
Cylinder and doffer strippings	.62	.97	1.12	1.16	1.13	1.56	.75	.96
Motes and fly	2.81	1.65	2.02	4.34	1.68	3.57	1.82	3.25
Sweepings	.11	.17	.11	.31	.18	.17	.18	.14
Total visible	6.11	5.67	6.57	9.34	5.63	9.23	5.32	7.33
Invisible	.28	[c] 1.24	[c] .79	.22	.82	.89	1.78	.66
Total visible and invisible	6.39	4.43	5.78	9.56	6.45	10.12	7.10	7.99
THROUGH CARDS.[a]								
Total visible	8.23	7.04	8.21	11.99	6.85	10.75	7.24	10.24
Total invisible	3.20	[c] .22	.40	1.33	1.06	2.36	1.99	2.33
Total visible and invisible	11.43	6.82	8.61	13.32	7.91	13.11	9.23	12.57

[a] Based upon net weight fed to bale breaker. [b] Based upon net weight fed to cards. [c] Gain.

[2] See U. S. Department of Agriculture Bulletin 591: Manufacturing Tests of the Official Cotton Standards for Grade, by William S. Dean and Fred Taylor. 1917.

The visible waste discarded by a cleaning machine can be governed by the settings used on that machine.

The invisible waste can not be governed with any degree of accuracy, since it depends upon the grade and character of the cotton and the relative humidity at the time the cotton is run. Table 2 shows that there was a large invisible loss on the grade of Low Middling on the pickers. This loss is partly accounted for by the low relative humidity and high temperature existing while this grade was being run. (See Table 3.)

TABLE 3.—*Average temperature and relative humidity in picker and card room.*

Room.	L.M.	G.M.Y.T.	M.Y.T.	L.M.Y.T.	G.M.Y.S.	M.Y.S.	G.M.B.S.	M.B.S.
Pickers:	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
Average temperature	81	85	86	90	85	79	77	88
Average relative humidity	45	69	70	60	65	62	65	61
Cards:								
Average temperature	81	81	81	84	79	81	80	91
Average relative humidity	63	73	75	69	68	64	71	63

All grades except G.M.Y.S., M.Y.S., and M.B.S. stood overnight between the pickers and the cards.

If the total percentages of waste are used as a basis of value the following order is obtained:

(1) Good Middling Yellow Tinged; (2) Good Middling Yellow Stained; (3) Middling Yellow Tinged; (4) Good Middling Blue Stained; (5) Low Middling; (6) Middling Blue Stained; (7) Middling Yellow Stained; (8) Low Middling Yellow Tinged.

MOISTURE DETERMINATIONS.

Samples of each grade of cotton were taken at each machine or process, weighed on a sensitive equal-arm balance, placed in air-tight cans, and shipped to Washington, dried to absolute dryness, and reweighed on equally sensitive balances. The moisture content of each sample was then calculated. The results are shown in Table 4.

The low humidity conditions noted on the pickers while the Low Middling grade was being run are checked by the moisture content of the samples taken at this process.

TABLE 4.—*Percentages of moisture*[1] *in the cotton of the different grades at various points in the cotton-manufacturing processes.*

Sample.	L.M.	G.M.Y.T.	M.Y.T.	L.M.Y.T.	G.M.Y.S.	M.Y.S.	G.M.B.S.	M.B.S.
	Per ct.	*Per cent.*	*Per ct.*	*Per cent.*	*Per cent.*	*Per ct.*	*Per cent.*	*Per ct.*
Raw cotton from bale breaker	5.59	7.47	6.55	6.78	7.18	7.75	6.44	6.72
Lap from opener-breaker lapper	4.17	8.28	7.58	6.72	7.47	6.95	6.67	6.67
Lap from finisher picker	4.17	8.64	7.70	6.61	7.53	7.41	6.49	5.88
Sliver from cards	5.04	8.17	6.89	6.44	6.95	6.49	6.38	5.71
Sliver from finisher drawing	6.21	7.64	7.47	6.21	7.24	7.18	6.61	5.93
Roving from fine frame	8.51	6.78	6.83	6.78	7.00	6.38	5.26	5.76
22's yarn	6.67	6.49	5.99	7.24	6.04	6.38	5.54	5.76

[1] Percentages expressed as "regain."

STRENGTH OF YARNS.

Each grade of cotton was spun into 22's yarn. The turns per inch inserted were 19.9, 21.1, and 22.3, using twist multipliers of 4.25, 4.50, and 4.75, respectively.

In the cotton-testing laboratory at Washington each grade and twist was reeled into skeins of 120 yards and broken under constant relative humidity conditions of 65 per cent at 70° F.

TABLE 5.—*Comparing the breaking strength of 22's yarn with different twists.*

Twist multiplier.	Turns per inch.	L.M.	G.M.Y.T.	M.Y.T.	L.M.Y.T.	G.M.Y.S.	M.Y.S.	G.M.B.S.	M.B.S.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
4.25	19.9	79.9	84.2	89.0	79.1	83.4	82.1	76.1	75.8
4.50	21.1	81.3	85.7	88.5	81.2	87.2	82.9	76.6	79.5
4.75	22.3	77.3	81.9	82.6	77.2	82.6	77.1	73.2	77.5

Table 5 shows that the yarn of each grade spun with the twist multiplier of 4.50 was the strongest. This fact is very important because the twist multiplier of 4.75 is usually used as a standard for warp yarns where strength is required. There is one exception to the above fact; in the case of the Middling Yellow Tinged the strongest break per skein was obtained with a twist multiplier of 4.25. This difference, however, is so small that it is scarcely to be considered.

The yarn with 21.1 turns per inch, or the 4.50 twist multiplier, broke on an average 2.05 per cent stronger than that with 19.9 turns per inch, or 4.25 twist multiplier, and 5.32 per cent stronger than that with 22.3 turns per inch, or the 4.75 twist multiplier.

Comparing the breaking strengths of the yarns with the same twist, there appears to be no definite relationship between the strength of the yarn and the grade of the cotton from which it is spun.

Arranging the grades in the order of their strength values, a slightly different order is observed than when they are arranged in the order of their waste values, the order of strength values being Middling Yellow Tinged, Good Middling Yellow Stained, Good Middling Yellow Tinged, Middling Yellow Stained, Low Middling, Low Middling Yellow Tinged, Middling Blue Stained, and Good Middling Blue Stained.

The breaking strength of the yarn was also tested by the single-strand method. The results of these tests are shown in Table 6 and indicate a slight difference in the relationship between the strength of the different grades from that found in the skein tests.

TABLE 6.—*Average breaking strength in ounces of single strands from 22's yarn. (Twist multipliers 4.25, 4.50, and 4.75.)*

Twist multiplier.	L.M.	G.M.Y.T.	M.Y.T.	L.M.Y.T.	G.M.Y.S.	M.Y.S.	G.M.B.S.	M.B.S.
	Ounces.	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*
4.25	10.4	11.0	11.2	11.1	11.8	11.0	10.0	10.2
4.50	10.4	11.1	11.9	11.0	11.1	10.4	10.5	10.9
4.75	10.6	11.4	11.2	10.7	11.8	10.5	9.9	10.7

MANUFACTURING PROPERTIES.

On opening the several grades the Middling Yellow Stained and Low Middling Yellow Tinged gave off a considerable amount of dust. No noticeable feature was encountered in running the other grades through the pickers.

On the cards the Middling Yellow Stained and Low Middling Yellow Tinged gave off considerable fly at stripping time. These grades were followed in order by Good Middling Yellow Stained, Middling Blue Stained, and Middling Yellow Tinged. The remaining grades had the usual amount of fly. During a 10-hour day on a commercial basis the cards would have to be stripped four times for the Middling Yellow Stained and Low Middling Yellow Tinged; three times on the Good Middling Yellow Stained, Middling Blue Stained, and Middling Yellow Tinged; and twice a day on the Good Middling Blue Stained, Low Middling, and Good Middling Yellow Tinged.

A large amount of trash and fly collected on the roller beams of the roving frames and spinning frame. The largest amount was noticed on the Middling Yellow Stained and Low Middling Yellow Tinged, followed in order by Good Middling Yellow Stained, Middling Blue Stained, Middling Yellow Tinged, Good Middling Blue Stained, Low Middling, and Good Middling Yellow Tinged.

On the spinning frame the only grade that gave any trouble was the Good Middling Blue Stained. The other grades would go a full doff without more than one or two ends breaking down, whereas the Good Middling Blue Stained had about twice as many down in the same time.

The Middling Yellow Stained yarn contained a considerable amount of leafy trash.

BLEACHING PROPERTIES.

Bleaching and dyeing tests were made in the textile department of the North Carolina State College of Agriculture and Engineering and under commercial conditions in a bleachery at Providence, R. I.

The three different twists of 22's yarn made from each grade were tested.

TEXTILE SCHOOL TESTS.

Bleaching:

Scouring.—The yarn was washed in cold water for 15 minutes, after which it was boiled in a 2-degree Twaddle solution of caustic soda for 7 hours. It was then washed twice in cold water and hydroextracted.

Chemicking.—The yarn was bleached in a $1\frac{3}{4}$-degree Twaddle chlorine solution for 2 hours. It was then washed for 30 minutes in cold water and hydroextracted.

Souring.—The yarn was soured for $1\frac{1}{2}$ hours in a $1\frac{1}{2}$-degree Twaddle solution of sulphuric acid and then washed in cold water until free from chlorine.

Soaping.—The yarn was soaped in a solution of 5 per cent Solvay soda and 0.012 per cent methylene blue, which was heated to 160° F. It was then washed in hot water at 120° F., then in cold water, hydroextracted and dried.

The best bleach was obtained on Good Middling Yellow Tinged, followed in order by Good Middling Yellow Stained, Low Middling, and Middling Yellow Stained, each of which gave a good commercial white. The other four grades did not give a satisfactory white. The Middling Yellow Tinged and Low Middling Yellow Tinged had a bluish appearance, while the Good Middling Blue Stained and Middling Blue Stained had a decided slaty or bluish cast. The Middling Blue Stained came out the poorest white of all the grades tested, the bleaching process having practically no effect upon the blue color of this grade. The greatest improvement was noticed in the case of Middling Yellow Stained, this grade having a deep yellow color and considerable trash before bleaching. After processing, this grade had the fourth best white and in addition had lost most of its trash. A trial test was made on the blue stains by putting them through the bleaching solution and acid a second time. Their whiteness was not improved by this double bleach.

Dyeing:

Tests were made on the eight grades by dyeing them with direct colors—pink and blue.

Pink.—The bleached yarn was dyed with the following formula: 0.5 per cent amidine fast pink, 6 per cent Glauber's salt, and 2 per cent Solvay soda. The yarn was treated in this bath for 30 minutes at 140° F., washed in warm water (120° F.), rinsed in cold water, and dried.

The best pinks were obtained on the grades that gave the best bleach. The best pink was obtained on the Good Middling Yellow Tinged, followed in order by Good Middling Yellow Stained, Low Middling, Middling Yellow Stained, Middling Yellow Tinged, Low

Middling Yellow Tinged, Good Middling Blue Stained, and Middling Blue Stained.

Blue.—The bleached yarn was dyed with the following formula: 2 per cent brilliant fast blue 2G, 0.5 per cent Pluto Black 5 P. S. Extra, 10 per cent Glauber's salt, and 2 per cent Solvay soda. The yarn was treated in this bath for 1 hour at 180° F., washed in warm water (120° F.), and then in cold water and dried.

Good blues were obtained on all the grades, with very little difference in depth of color.

Breaking strength of bleached and dyed yarns:

Single-strand tests were made of the gray, bleached, and dyed yarns to determine the effect of bleaching and dyeing on the strength of the yarns. The results of these tests are shown in Table 7. To put the results on a commercial basis, different skeins were used in the gray, bleached, and dyed tests.

TABLE 7.—*Average breaking strength in ounces of single strands from gray bleached, and dyed yarn spun from the different grades of cotton. (Textile School Test.)*

Yarn.	L.M.	G.M. Y.T.	M.Y.T.	L.M. Y.T.	G.M. Y.S.	M.Y.S.	G.M. B.S.	M.B.S.	Average.
4.25*y*/22:	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*
Gray	10.4	11.0	11.2	11.1	11.8	11.0	10.0	10.2	10.84
Bleached	9.4	12.0	10.5	11.3	12.2	11.9	10.9	9.4	10.95
Dyed pink	10.3	10.5	11.1	10.1	11.6	12.2	11.3	10.0	10.89
Dyed blue	9.4	11.4	10.6	8.7	11.0	10.4	9.6	10.0	10.14
4.50*y*/22:									
Gray	10.4	11.1	11.9	11.0	11.1	10.4	10.5	10.9	10.91
Bleached	10.4	12.0	10.9	10.2	11.7	9.8	9.0	10.4	10.55
Dyed pink	10.0	11.9	10.0	10.1	11.0	12.0	9.7	9.6	10.48
Dyed blue	10.1	11.9	10.8	9.6	10.7	11.5	10.1	9.2	10.49
4.75*y*/22:									
Gray	10.6	11.4	11.2	10.7	11.8	10.5	9.9	10.7	10.85
Bleached	9.7	8.7	11.6	11.4	11.8	12.0	9.2	9.5	10.49
Dyed pink	10.1	11.2	10.4	9.6	10.7	10.5	9.3	9.5	10.16
Dyed blue	9.3	10.7	11.0	9.9	10.7	10.9	10.2	9.4	10.26

MILL TEST.[3]

Tests were made at a bleaching and dyeing plant to give results under commercial conditions. Both the chlorine and peroxide bleaches were tried on all the different grades.

Chlorine bleach:

Scouring.—The yarn was first washed in cold water and boiled for 2 hours in a solution of 2 per cent caustic soda and 1 per cent Turkey Red Oil.[4] It was then washed in cold water.

Souring.—The yarn was soured in 1 per cent hydrochloric acid for one-half hour and then washed in cold water.

[3] These tests were made in a mill at Providence, R. I. The tests were conducted by Chris. E. Folk, assistant in cotton testing. Valuable assistance was rendered by E. S. Graves, general manager, and W. A. Traver, superintendent of the mills.

[4] All percentages are based on weight of the goods being bleached.

Chemicking.—The yarn was bleached in a 1½-degree Twaddle chlorine solution for 2 hours and washed in cold water.

Wash.—The yarn was washed in 2 per cent bisulphite of soda for one-half hour—cold. It was then washed in warm water (160° F.) for 10 minutes and then in cold water and dried.

Fair whites were obtained on two grades only, when using this bleach, namely Good Middling Yellow Tinged and Low Middling.

Double-boil chlorine bleach:

The time of boiling with the caustic soda was doubled over the time used in first chlorine bleach to see if the length of time in the boil affected the whites obtained. The yarn was boiled for 2 hours in a solution of 2 per cent caustic soda and 1 per cent Turkey Red Oil, after which it was drawn off and a new solution of the same strength was put into the machine and the boiling continued 2 hours longer. The yarn was then soured and bleached in the same manner as in the first chlorine bleach.

A good commercial white was obtained on Good Middling Yellow Tinged, Low Middling, and Good Middling Yellow Stained under these conditions.

Peroxide bleach:

Scouring.—The yarn was first washed in cold water and then boiled one-half hour in a solution of 2 per cent Turkey Red Oil, then washed in cold water.

Bleaching.—The yarn was bleached in the solution shown below:

7½ gallons of water.
5¾ ounces sulphuric acid.
4¾ ounces sodium peroxide.
4¾ ounces sodium silicate.

This solution was kept at 180° F. and run until exhausted. It was tested every 10 minutes and found to be exhausted in 1½ hours. The yarn was then rinsed in cold water.

Wash.—The yarn was washed in three different warm waters—the first at 120° F., the second at 100° F., and the third at 90° F. It was then washed in cold water and dried.

Good Middling Yellow Tinged and the Low Middling were the only grades that gave fair whites.

Double peroxide bleach:

The yarn was treated in the same manner as the first peroxide bleach except that the time was doubled in the bleaching, a fresh solution being made up when the first was exhausted.

Good commercial whites were obtained on Good Middling Yellow Tinged, Low Middling, and Good Middling Yellow Stained.

Dyeing:

Tests were made on the eight grades by dyeing the yarns with vat colors—pink and blue.

Pink.—The bleached yarn was dyed with the following formula: 2 per cent penetrol, 2½ per cent caustic soda, 2¾ per cent hydrosulphite, and 4 per cent indanthrene Red B. N. It was dyed at 120° F., and run for 45 minutes, then washed in hot water and dried. The best pinks were obtained on the grades giving the best bleach. The best pink was obtained on Good Middling Yellow Tinged, followed in order by Low Middling, Good Middling Yellow Stained, Middling Yellow Stained, Middling Yellow Tinged, Low Middling Yellow Tinged, Good Middling Blue Stained, and Middling Blue Stained.

Blue.—The bleached yarn was dyed with the following formula: 2 per cent penetrol, 8½ per cent caustic soda, 8½ per cent hydrosulphite and 12 per cent indanthrene G. C. D. blue. The yarn was dyed at 120° F. for 45 minutes, then washed for 10 minutes in hot water (160° F.), then in cold water and dried. Good blues were obtained on all the grades, there being very little difference in depth of color.

Breaking strength of bleached and dyed yarns:

Single-strand strength tests were made of the gray, bleached, and dyed yarns to determine the effect of the bleaching and dyeing processes. The results of these tests are shown in Table 8. In order to put the results on a commercial basis, different skeins were used on the gray, bleached, and dyed tests.

TABLE 8.—*Breaking strength in ounces of single strands from gray, bleached, and dyed yarn spun from the different grades of cotton. (Mill test.)*

Yarn.	L.M.	G.M. Y.T.	M.Y.T.	L.M. Y.T.	G.M. Y.S.	M.Y.S.	G.M. B.S.	M.B.S.	Average.
	Double boil chlorine.				Double peroxide.				
4.25√22:	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*	*Ounces.*
Gray	10.4	11.0	11.2	11.1	11.8	11.0	10.0	10.2	10.84
Bleached	10.4	11.5	12.1	10.7	13.0	12.6	11.0	11.4	11.59
Pink	10.4	11.1	11.1	11.0	12.4	11.7	11.1	10.9	11.21
Blue	10.4	11.9	11.1	10.8	11.3	12.0	10.0	9.8	10.91
	Single peroxide.								
4.50 √22:									
Gray	10.4	11.1	11.9	11.0	11.1	10.4	10.5	10.9	10.91
Bleached	9.7	12.4	11.8	10.7	13.3	12.4	10.0	9.7	11.25
Pink	10.0	12.9	11.5	11.2	11.1	12.4	10.8	10.9	11.35
Blue	10.2	11.6	12.0	11.7	11.4	11.8	9.9	11.0	11.20
	Single chlorine.								
4.75 √22:									
Gray	10.6	11.4	11.2	10.7	11.8	10.5	9.9	10.7	10.85
Bleached	11.6	11.8	12.6	11.9	11.4	11.4	10.0	11.0	11.46
Pink	10.7	11.4	10.9	10.6	11.9	10.5	10.5	10.5	10.88
Blue	10.9	11.7	11.4	10.3	10.1	10.8	9.5	10.2	10.62

SUMMARY.

Low Middling, Good Middling Yellow Tinged, Middling Yellow Tinged, Low Middling Yellow Tinged, Good Middling Yellow Stained, Middling Yellow Stained, Good Middling Blue Stained, and Middling Blue Stained cotton selected throughout the cotton belt were tested to determine their relative spinning values.

All the grades were subjected to the same mechanical conditions. These conditions were the same as those used on earlier tests of the Official Cotton Standards of the United States for Upland white cotton.

The percentages of visible waste made by the different grades were as follows:

Grade.	White.	Yellow Tinged.	Yellow Stained.	Blue. Stained.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Good Middling	.....	7.04	6.85	7.24
Middling	.....	8.21	10.75	10.24
Low Middling	8.23	11.99	.....	.....

From the percentages of visible waste it appears that the waste follows the grade of the cotton.

The Middling Yellow Stained and Low Middling Yellow Tinged gave off considerable fly. These grades were followed in order by Good Middling Yellow Stained, Middling Blue Stained, and Middling Yellow Tinged. The remaining three grades gave off the usual amount of fly.

The breaking strengths in pounds per skein of 120 yards of 22's yarn ($4.50\times\sqrt{22}$) spun from the different grades were as follows:

Grade.	White.	Yellow Tinged.	Yellow Stained.	Blue Stained.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
Good Middling	.....	85.7	87.2	76.6
Middling	.....	88.5	82.9	79.5
Low Middling	81.3	81.2	.....	.....

These results show that the highest grade did not always give the strongest yarn.

The bleaching and dyeing tests show that Low Middling, Good Middling Yellow Tinged, Good Middling Yellow Stained, and Middling Yellow Stained can be bleached satisfactorily for white yarns. The Middling Yellow Tinged and Low Middling Yellow Tinged when bleached can be used for dyeing both light and dark shades.

The Good Middling Blue Stained and Middling Blue Stained can be bleached satisfactorily for dyeing dark shades only.

The single-strand tests show that the bleaching and dyeing processes do not materially affect the strength of the yarn, as shown by the average of all tests: Gray, 10.73 ounces; bleached, 11.05 ounces; pink, 10.83 ounces; blue, 10.60 ounces.

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